

**An Investigation of Three Important Factors Affecting Soil Moisture in Land-
Atmosphere Interactions: Surface and Groundwater Interactions;
Surface Runoff Generations; and Subgrid Spatial Variabilities**

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Budget Period: 1 year (5-15-2003 to 5-14-2004)

Summary

There are two major tasks to be accomplished over one year period for this project. There are to test and evaluate vigorously impacts of two newly developed land surface model parameterizations on soil moisture simulations using VIC-3L as a testbed. The two new parameterizations are surface runoff generation mechanisms that consider spatial subgrid variability (i.e., saturation and infiltration excess runoff generation mechanisms) and surface and groundwater interactions. The sites and data proposed to use for these offline validation and evaluation tests are:

- (1) **Pennsylvania:** Three watersheds in PA where groundwater tables and streamflow data are available. The limitation at these three sites in PA is the availability of soil moisture measurement at different soil layers; and
- (2) **Oklahoma:** Little Washita watershed where data from SGP97 hydrology Experiment with detailed soil moisture measurement, water and energy fluxes (Famiglietti et al., 1999; Mohanty et al., 2000)) and the data from recent ARM/GCIP near surface observation (NESOB) data set (<http://www.joss.ucar.edu/gcip/nesob/>) will be used. The limitation at this site is the availability of groundwater table.

During past months of the project period, we have finished testing and evaluating the two new model parameterizations using watersheds in PA. We also did sensitivity analyses. Our results show that the two processes are very important on soil moisture simulations, and that the impacts are different under different climate conditions. Although we started our research on testing and evaluating the impacts with the Oklahoma soil moisture data, we could not finish the studies by May 14, 2004. Therefore, we would like to request for one year extension without cost to finish our project.

Request for one year extension without cost

The main reason for not finishing the task for the Oklahoma site is the time we spent on finding the bugs in the UW version of the VIC-3L model that was used as the testbed in this project. One bug was that the diffusion process that was in the old version of VIC-3L (e.g., Liang et al., 1996; 1999) was missing in the UW VIC-3L version released at the

time we used for the project, and the other bug was related to radiation. We have reported our discovery of the new bugs to Dr. Dennis Letternmaier and Dr. Eric Wood in September 2003.

Task to be done during 5-15-04 to 5-14-05

In the extended one year, we will finish our proposed task on testing and evaluating the impacts on soil moisture with the Oklahoma soil moisture data as described in the original project description. Also, we will finish writing a final project report, and a high quality journal paper.